Introduction

In this section, the lessons focus on solving problems that use whole number operations.

These lessons form an outline for your ARI classes, but you are expected to add other lessons as needed to address the concepts and provide practice of the skills introduced in the *ARI Curriculum Companion.*

Some of the lessons cross grade levels, as indicated by the SOL numbers shown below. This is one method to help students connect the content from grade to grade and to accelerate.

For the lessons in this section, you will need the materials listed at right.

> **MATERIALS SUMMARY**
> Math textbooks
> Highlighters or colored pencils
> Calculators (optional)
> Chart paper
> Counters

Standards of Learning

The following Standards of Learning are addressed in this section:

5.3   The student will create and solve problems involving addition, subtraction, multiplication, and division of whole numbers, using paper and pencil, estimation, mental computation, and calculators.

5.5   The student, given a dividend of four digits or fewer and a divisor of two digits or fewer, will find the quotient and remainder.

6.7   The student will use estimation strategies to solve multistep practical problems involving whole numbers, decimals, and fractions (rational numbers).

7.4   The student will
   a)   solve practical problems using rational numbers (whole numbers, fractions, decimals) and percents; and
   b)   solve consumer-application problems involving tips, discounts, sales tax, and simple interest.

Table of Contents

Lesson plans pertaining to the following Standards of Learning are found in this section. Click (or CTRL+click) on each to jump to that lesson.

✱ SOL 5.3

Prerequisite SOL

4.4

Lesson Summary

Students identify place value and round numbers through million. (20–30 minutes)

Materials

Copies of the attached worksheets

Warm-up

Have students complete the attached "Whose Place Is This?" worksheet. Review responses with the students, making sure that they can accurately write the numbers in expanded form.

Lesson

1. Ask students to describe how to round a number. Understanding how much prior knowledge the students have about this topic will help you focus your teaching. Ask what the connection is between place value and numbers written in expanded form. Lead them to understand that expanded notation shows how numbers of various place values combine to create the overall digit. For example, the number 2,893 written in expanded form would be 2,000 + 800 + 90 + 3 (or 2 thousands plus 8 hundreds plus 9 tens plus 3 ones).

2. Write these numbers on the board, and have students copy them on a sheet of paper:

    4<u>6</u>4   1<u>6</u>   2,<u>5</u>12   2<u>1</u>,975   39<u>3</u>,412

    Ask which place value is underlined in the number 4<u>6</u>4 and which place value is used to round the number to *this* place value. Have students draw an arrow from the underlined digit to the digit on its right. Explain that the digit to the right of the underlined digit is used to round the number to the *underlined digit's place value*. Stress the rounding rule they must know: Less than five, round down; greater than or equal to five, round up.

3. After students have rounded 4<u>6</u>4 to 460, work with them to complete the remaining examples, making sure they understand the process and can round numbers without assistance.

4. Have students complete the attached "Round 'Em" worksheet independently. When they are finished, review the answers with the class. The "Father of Mathematics" is PYTHAGORAS.

Reflection

Have students complete the questions on the Reflection worksheet individually.

Name: _____

Who's Place Is This?

Josh and Kim are playing a place-value game. They each draw a card out of a bowl and compare.

For each pair of numbers selected, circle the number in which the underlined digit has the greatest value, as shown below in Play 1. Also circle the number of points earned for the person with the greatest value. In case of a tie, each person gets the points.

When finished, add up the circled points for each player and see who won the game.

Josh

Play	Number	Points
1	30,2̲41	22
2	9,6̲74,218	41
3	5̲74,399	25
4	52̲,718	36
5	2,8̲70,000	27
6	65̲,209	36
7	4,6̲12	55
8	1,3̲62,000	27
9	6,5̲28	27
10	17,01̲6	22
11	98̲,650	51
12	72̲9,502	25
13	57̲,628	36
14	521̲	37
15	1,627,0̲14	36
	TOTAL _____	

Kim

Play	Number	Points
1	(32,̲041)	(35)
2	6̲,082	45
3	475̲,231	16
4	8,2̲27	29
5	78̲,120	25
6	6,5̲29	29
7	76̲8	47
8	13̲2,706	21
9	75̲,628	42
10	70,1̲16	37
11	2,418̲,099	35
12	467,2̲90	45
13	7̲5,214	29
14	21̲1	25
15	460̲,111	21
	TOTAL _____	

Name: _____

Round 'Em

1. Look at the chart below. Round each of the 10 numbers in the left-hand column to the underlined place value.

2. Circle the *letter* beside the correct answer in that row.

	Number		Answers						
1	12,125	D	12,200	P	12,100	A	12,000	T	13,000
2	4,274	H	4,300	R	4,000	Y	4,270	M	4,280
3	48,309	E	58,000	T	50,000	I	48,000	O	40,000
4	608	A	600	N	1,000	H	610	M	0
5	71	S	100	A	70	C	0	P	80
6	25,003	E	25,000	D	20,000	G	30,000	R	26,000
7	9,724	O	10,000	S	9,000	W	9,700	A	0
8	3,048	N	3,100	G	3,500	O	4,000	R	3,000
9	651,027	T	600,000	A	700,000	S	650,000	C	660,000
10	1,097,269	E	1,100,000	S	1,000,000	H	0	N	10,000,000

3. Who was the "Father of Mathematics"? To find the answer to this question, write the circled letters from the chart above in the corresponding boxes below:

1	2	3	4	5	6	7	8	9	10

Name: _____

Reflection

Below are two released SOL test questions. Circle the correct answer, and explain in your own words and/or drawings how you found the answer.

1. There were 75,631 people at a concert. What was the number of people rounded to the nearest ten thousand people?

   F   60,000

   G   70,000

   H   80,000

   J   90,000

   Explanation: _____

   _____

   _____

2. Riley read that the population of Virginia in 1790 was 747,610. What is 747,610 rounded to the nearest hundred thousand people?

   A   700,000

   B   747,000

   C   750,000

   D   800,000

   Explanation: _____

   _____

   _____

✶ SOL 5.3, 6.7, 7.4

Prerequisite SOL

5.5

Lesson Summary

Students explore and discuss the importance of remainders in division. (30 minutes)

Materials

Copies of the attached worksheets

Vocabulary

Quotient. The answer when performing division.

Warm-up

Have students complete the "What Do I Do with This?" worksheet. Hold a class discussion in which students explain their responses.

Lesson

1. Ask the class whether remainders are important to consider when solving division problems. Encourage them to be as specific as possible in their responses.
2. Have students complete the "Remainders" worksheet, allowing them as much time as they need to complete the problem set. Instruct them not to write the summary sentence yet.
3. Review students' responses, and discuss and correct any errors.
4. Give students a few minutes to write their summary statements.
5. Encourage the students to discuss their summary statements. Highlight any similarities and/or differences among the statements.

Reflection

Have students complete the "Exit Ticket" worksheet.

Name: _____

What Do I Do with This?

Problem	Do the math	Is the remainder important? (Y/N)	Explain why, or why not.
There are 26 seventh-grade students going to the big game against County Middle School. If 4 students can ride in one car, how many cars do they need?			
The Foreign Language Club is selling raffle tickets. Each ticket costs $3. The Club wants to make $110. How many tickets will the club need to sell?			
The volleyball coach wants to buy new warm-up suits for her team. The suits cost $20. The coach has $210. How many warm-up suits can she buy?			
County Middle School is buying pizza for all of its students. Each pizza has 8 slices. Each student will receive 1 slice. There are 700 students at County Middle School. How many pizzas will the school need to buy?			
The homecoming game is next week, and the students want to hang banners around the school. The students want to put up 110 banners. The banners come in packs of 40. How many packs will the students need to buy?			

Name: _____

Remainders
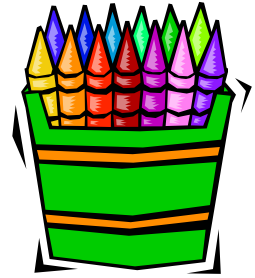
1. A full box of crayons contains 8 crayons. If each of the 26 students in a class needs to use 1 crayon simultaneously in a class activity, how many full boxes of crayons will be used?

    How many more crayons will be needed in addition to the ones in these full boxes?

2. Juice boxes are sold in packs of 6. If 35 students eat lunch at one time, how many packs of juice boxes will the cafeteria need to open in order to serve them?

3. The school is buying extra juice boxes for their annual Field Day. Each pack of juice boxes costs $3. How many packs of juice boxes can the school purchase with $212?

Summary Statement

Are remainders important? Explain why, or why not.

_____

_____

_____

Name: _____

Exit Ticket

1. How are these word problems different?

Problem 1	**Problem 2**
A box can hold 6 baseballs. There are 50 baseballs. How many boxes can be filled?	A team needs 12 bats. There are 5 bats in a pack. How many packs will the team need?

Explain:

_____

_____

_____

2. Write two word problems involving division — one in which the remainder matters and one in which it does not.

Problem 1	**Problem 2**

Explain:

_____

_____

_____

✱ SOL 5.5

Prerequisite SOL
4.8

Lesson Summary
Students find the quotients and remainders of division problems, given dividends of four digits or fewer and divisors of two digits or fewer. (45 minutes)

Materials
Copies of the attached worksheets

Vocabulary
Quotient. The answer when performing division.

Background
This lesson is designed to help students sharpen their division skills. The problem set in this activity is appropriate for students who understand the basic division algorithm but who may have difficulty completing a long-division exercise.

Warm-up
Division can also be thought of as repeated subtraction, although with long division, the dividends and divisors grow too large to make repetitive subtraction a viable problem-solving strategy. Ask students to complete the attached warm-up worksheet, "Dividing Differently," in which they must subtract a number repeatedly until they reach zero or a remainder. Continue to discuss this process in the following lesson.

Lesson
1. Ask the class what the warm-up activity has to do with division. How is subtraction like division? Allow time for students to share their thoughts.
2. Continue the discussion by asking students to describe the difference between problems 1 and 2 versus problems 3 and 4 on the warm-up worksheet. Students may offer various ideas, but guide them toward recognizing the difference in the level of difficulty of the problems and the difference in the time it took to reach the solutions. Ask whether repeatedly subtracting a number to find the quotient is a good strategy to choose when dividing. Students may say "yes" for smaller dividends and divisors but "no" for larger ones, although they should already be accustomed to dividing single digits, using basic arithmetic facts.
3. Distribute copies of the process flow chart "Division: My Steps," and have students write a division problem in the oval at top center, for example, 712 ÷ 32. Allow the students to tell you how they would solve the problem. Listen carefully for them to identify the specific steps of a division algorithm, and have them write the steps they describe in their chart. Note that there are many different versions of the division algorithm that are mathematically correct. Encourage a class discussion in which students share their algorithms.
4. Once the students have explained their division strategies, help them summarize their main points, and have them write the main points in their chart.
5. Distribute copies of the "I Dare You to Divide!" worksheet, and give students time to work through each problem. Have them circle parts of any problem that they find difficult. Discuss these parts individually with students as you walk around the room.
6. Review the solutions with the students.

Reflection
Have students write the letter for the prompt on the "Reflection" worksheet.

Name: _____

Dividing Differently

Division can separate a large group of objects into smaller groups of objects. Repeated subtraction can do the same thing.

Example: Subtract 4 from 24 repeatedly until you reach 0 or have a remainder. Then, write the corresponding division equation.

Repeated subtraction:

$$\begin{array}{r} 24 \\ -\ 4 \\ \hline 20 \\ -\ 4 \\ \hline 16 \\ -\ 4 \\ \hline 12 \\ -\ 4 \\ \hline 8 \\ -\ 4 \\ \hline 4 \\ -\ 4 \\ \hline 0 \end{array}$$
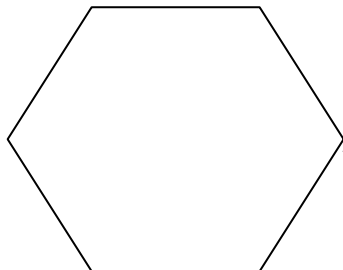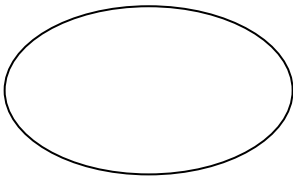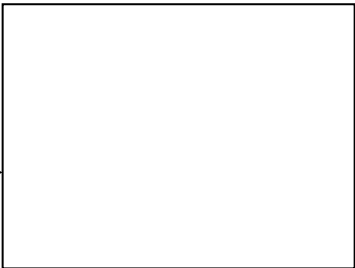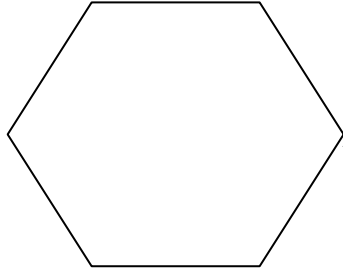
Division equation: $24 \div 4 = 6$
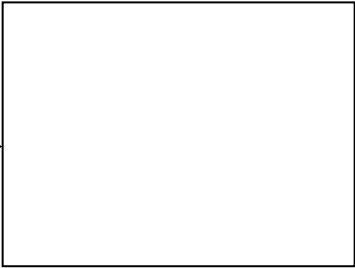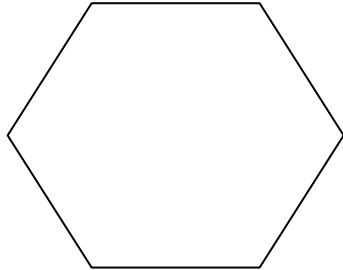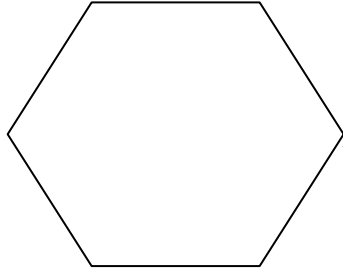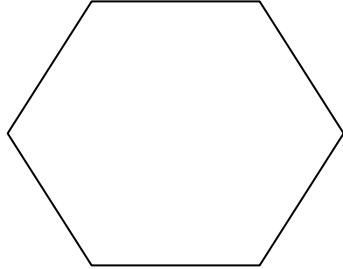
In the following problems, write the corresponding division equation after doing the subtraction.

1.   Subtract 7 from 56 repeatedly.

2.   Subtract 9 from 36 repeatedly.

3.   Subtract 8 from 144 repeatedly.

4.   Subtract 16 from 212 repeatedly.

Name: _____

Division: My Steps

Name: _____

I Dare You to Divide!

Find the quotients and remainders for the problems below by finding the missing numbers. There may or may not be a remainder.

1.
```
      1_
  33)627
   − 33
```

2.
```
      2_
  41)894
   − 82
```

3.
```
      2_
  18)440
   − 36
```

Remainder: __   **Remainder: __**   **Remainder: __**

4.
```
      2_
  31)868
```

5.
```
      4_
  23)970
```

6.
```
      7_
  24)1,776
```

Remainder: __   **Remainder: __**   **Remainder: __**

7.
```
      2_ _
  16)4,056
   − 32
```

8.
```
      4_
  44)2,178
   − 176
```

9.
```
      6_
  48)3,192
```
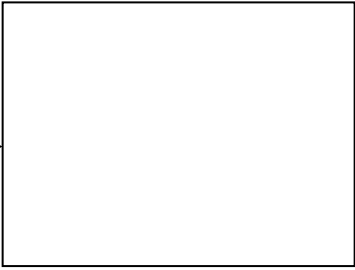
Remainder: __   **Remainder: __**   **Remainder: __**

10.
```
      5_ _
  62)3,375
```

11.
```
      57
  6)2,1_ _
```

12.
```
     _ 26
  1_)3,_ _ _
```

Remainder: __   **Remainder: __**   **Remainder: __**

Name: _____

Reflection

A new student has started at your school, and he is not yet very comfortable doing division. Write him a short explanation of how to divide, using as many of the vocabulary words (*dividend, divisor, quotient, remainder, multiple*) as you can. Also, create two division problems, and solve them for him so that he has examples to use in the future.

_____

_____

_____

_____

_____

_____

_____

Examples of two division problems, with solutions, for future reference:

✱ SOL 6.7, 7.4

Prerequisite SOL

Lesson Summary

Students solve multistep practical problems involving whole numbers by using the operations of addition, subtraction, multiplication, and division. (30–45 minutes)

Materials

Copies of the attached worksheets
Calculators (optional)
Highlighters or colored pencils

Warm-up

Students need to realize that all numbers in a word problem are not always needed for solving it. Have students complete the "Number Search" worksheet by choosing the appropriate numbers from each set to answer the questions.

Ask the class to explain the relevance of this warm-up activity. Accept all reasonable responses. Ask students what they learned from having many given numbers but not using all of them in each word problem. Give students a chance to explain and share their opinions with each other.

Lesson

1. Tell the class that they will be solving real-life word problems involving numbers that may or may not be needed for solving the problems. Distribute the "Who'll Paint the Hotel?" worksheet, and go over the proposal data with the class, encouraging questions about painting and the information in the proposals.

2. Allow students to work in pairs to solve the word problems. Have each student circle or underline the essential parts of each word problem and the numbers they will use to solve it. Encourage discussions, monitor the students' work carefully, and answer any questions they may have.

3. When students have finished, ask them to share their solutions and describe the strategies they used to solve the problems. Encourage all students to respond, as a discussion on different approaches to solving word problems will be helpful to all.

Reflection

Have students complete the "Reflection" worksheet individually.

Name: _____

Number Search

16   38

31 18
25

24 14
29

40
19

30   9
15   12
17   22

32 31
11 23

7   33
27   21
41   37
43
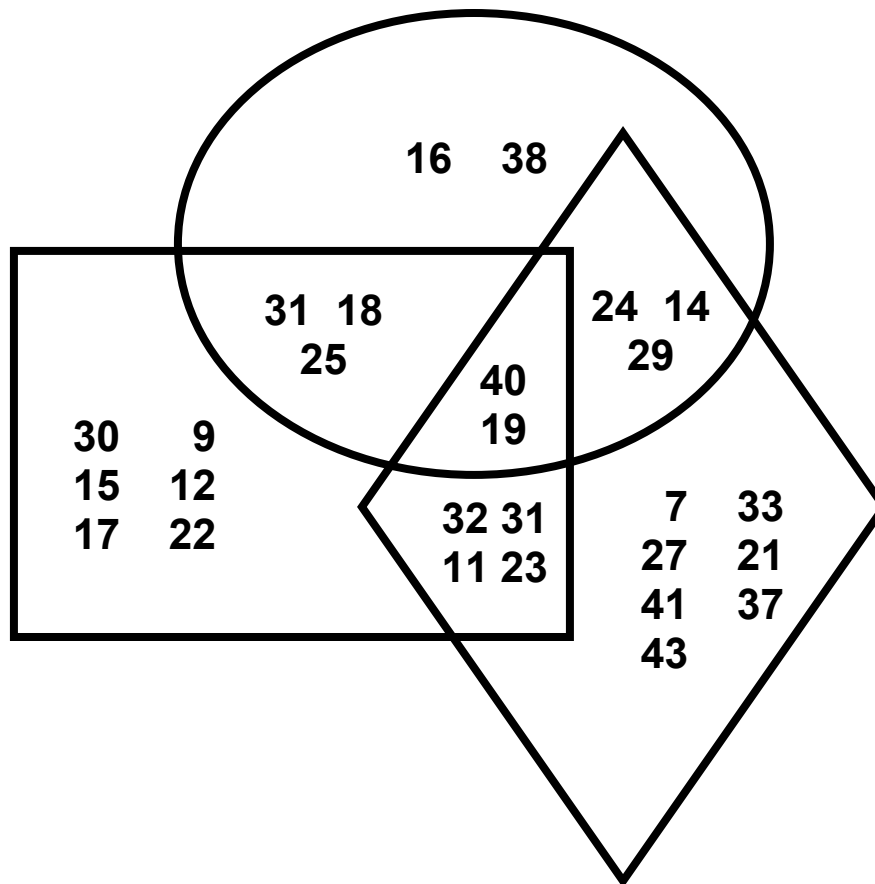
1. Which numbers are in the oval and the rectangle? _____

2. Which numbers are in the rectangle and the diamond? _____

3. What is the sum of the numbers in only the diamond? _____

4. Which numbers are in the oval but not in the rectangle? _____

5. Which numbers are in the rectangle but not in the diamond? _____

6. Which numbers are in only the oval? _____

7. Which numbers are in the oval and diamond but not in the rectangle? _____

8. Which numbers are in all three shapes? _____

Name: _____

Who'll Paint the Hotel?

The City Hotel has 30 rooms that need to be painted. The hotel manager is considering two painting companies for the job. He has gotten proposals from both companies, and now he's comparing the information in the proposals. Here's the data he's comparing:

PAINT SPECIALISTS	PRO PAINTERS
Proposal to paint 30 rooms at The City Hotel:	**Proposal to paint 30 rooms at The City Hotel:**
• Crew of 3 painters	• Crew of 4 painters
• Each painter can paint 300 square feet per hour.	• Each painter can paint 250 square feet per hour.
• Each room has 720 square feet of surface area to paint.	• Each room has 720 square feet of surface area to paint.
• We buy paint for $16 a gallon.	• We buy paint for $14 a gallon.
• One gallon of our paint covers 400 square feet.	• One gallon of our paint covers 350 square feet.

Answer the following questions:

Paint Specialists	Pro Painters
1. How many gallons of paint will be needed to paint the 30 rooms in the City Hotel?	1. How many gallons of paint will be needed to paint the 30 rooms in the City Hotel?
2. How much will it cost to buy the paint?	2. How much will it cost to buy the paint?
3. Can the crew of 3 painters finish the job in 2 days if each person works 7 hours a day?	3. Can the crew of 4 painters finish the job in 2 days if each person works 7 hours a day?
4. If not, how many days would it take to finish the job?	4. If not, how many days would it take to finish the job?
5. If each painter makes $8 an hour and works 26 hours, how much money would the entire crew get?	5. If each painter makes $9 an hour and works 22 hours, how much money would the entire crew get?
6. How much will it cost City Hotel to paint the rooms if Paint Specialists does the job?	6. How much will it cost City Hotel to paint the rooms if Pro Painters does the job?
7. City Hotel also needs its lobby painted. Its surface is 25 times greater than one hotel room. What is the amount of surface area to be painted? How much would it cost to buy the paint?	7. City Hotel also needs its lobby painted. Its surface is 25 times greater than one hotel room. What is the amount of surface area to be painted? How much would it cost to buy the paint?

8. Based only on this data, which company should the manager of City Hotel choose to paint the hotel? Explain why.

Name: <u>ANSWER KEY</u>

Who'll Paint the Hotel?

Paint Specialists	Pro Painters
1. How many gallons of paint are needed to paint the 30 rooms in the City Hotel? <u>54</u>	1. How many gallons of paint are needed to paint the 30 rooms in the City Hotel? <u>62</u>
2. How much will it cost to buy the paint? <u>$864</u>	2. How much will it cost to buy the paint? <u>$868</u>
3. Can the crew of 3 painters finish the job in 2 days if each person works 7 hours a day? <u>No</u>	3. Can the crew of 4 painters finish the job in 2 days if each person works 7 hours a day? <u>No</u>
4. If not, how many days would it take to finish the job? <u>4</u>	4. If not, how many days would it take to finish the job? <u>4</u>
5. If each painter makes $8 an hour and works 26 hours, how much money would the entire crew get? <u>$832</u>	5. If each painter makes $9 an hour and works 22 hours, how much money would the entire crew get? <u>$792</u>
6. How much will it cost City Hotel to paint the rooms if Paint Specialists does the job? <u>$1,696</u>	6. How much will it cost City Hotel to paint the rooms if Pro Painters does the job? <u>$1,660</u>
7. City Hotel also needs its lobby painted. The surface area is 25 times greater than one hotel room. What is the amount of surface area to be painted? How many gallons of paint would be needed? How much would it cost to buy the paint? <u>18,000 sq. ft.; 45 gal.; $720</u>	7. City Hotel also needs its lobby painted. The surface area is 25 times greater than one hotel room. What is the amount of surface area to be painted? How many gallons of paint would be needed? How much would it cost to buy the paint? <u>18,000 sq. ft.; 52 gal.; $728</u>

8. Based only on this data, which company should the manager of City Hotel choose to paint the hotel? Explain why.

   <u>Answers will vary.</u>

Name: _____

Reflection

Was this activity easy or difficult? _____ Why?

_____

_____

_____

What did you learn from this activity?

_____

_____

_____

✱ SOL 7.4

Prerequisite SOL
5.3, 6.7

Lesson Summary
Students solve multistep practical problems, using a variety of mathematical strategies. (30–45 minutes)

Materials
Copies of the attached worksheets
Calculators (optional)

Warm-up
Have students complete the "Choose the Correct Operation" worksheet. Identifying the operation to be used will increase students' familiarity with word-problem language and help them identify strategies to solve such problems.

Lesson
1. Lead a class discussion about ways to figure out what to do to solve a word problem. Ask students whether in the warm-up problems, they did anything differently in Step 2 from what they did in Step 1. Have students explain what strategies they used to decide on each operation. Listen carefully to their explanations, which will give valuable insight into the way they approach problem solving.

2. Create and post a class list of the strategies students employ to decide on the correct operations. Give a name to each strategy. Prompt thinking by asking such questions as: "Are there any other strategies you could add to this list? Which strategies do you use often? Which strategies do you use rarely? Why?"

3. Have the student pairs complete the "Using Different Strategies" worksheet, but ask them to leave the last column (Strategy Used) empty for now. Allow them time to complete the entire problem set. Give assistance when needed. When everyone is finished, review responses, and clear up any errors.

4. Refer the students back to the list of strategies discussed previously, and have them write in on the "Using Different Strategies" worksheet the strategy they used to solve each problem. Ask each student to explain his/her choices.

Reflection
Have students complete the "Reflection" worksheet individually.

Name: _____

Choose the Correct Operation

Read each word problem, and circle the operation or operations you'll use to solve it. Then show the steps used to solve it.

Word Problem	Operation	Step 1	Step 2
1. Allison paid for 3 school lunches at $3 each. She gave the office $20. How much change will she receive?	Addition Subtraction Multiplication Division		
2. The Drama Club is sewing their costumes for the play. One type of ribbon is $2 per yard, and they bought 3 yards. A second type of ribbon is $12 per yard, and they bought 5 yards. What was the cost of all the ribbon they bought?	Addition Subtraction Multiplication Division		
3. Don is fencing in his yard. He is also painting the fence white. Each of the 4 sides of the lawn is 15 ft. Each gallon of paint covers 20 feet. How much fencing and gallons of paint will Don need to buy?	Addition Subtraction Multiplication Division		
4. Susan bought 5 highlighters for $2 each and 4 pencils for $1 each. How much change will Susan receive if she pays $15?	Addition Subtraction Multiplication Division		
5. Marissa bought a new pair of jeans. The original price was $56, but she saved $19 by buying them on sale. She paid $40. How much change did Marissa receive?	Addition Subtraction Multiplication Division		

Name: _____

Using Different Strategies

Read each word problem. Then, show the steps for solving it, and write the answer. Finally, describe the strategy you used.

Word Problem	Steps	Answer	Strategy Used
1. Angela's soccer team washed 32 cars on Saturday. Each customer paid $4.75 for the wash. Did her team earn the $80 they needed for their new uniforms? How much did the team earn?			
2. Mark is having a picnic. He will prepare 3 hot dogs for each guest. There are 49 people coming. How many hot dogs will Mark prepare?			
3. Mr. Miller works 8 hours a day. Mrs. Miller works 6 hours a day. If Mr. Miller worked 96 hours in 2 weeks, how many hours did Mrs. Miller work during the same time?			
4. Scott invited his friends over for pizza. Scott ate 6 slices. His friend Billy ate half as much as Scott. David ate twice as many slices as Billy but 4 fewer than Terrence. How many slices of pizza did each boy eat?			
5. Maria had homework in 3 of her subjects. She finished all of it at 6:30 p.m. She spent 30 minutes on English and twice that long on science. She spent as long on math as she did on both English and science combined. At what time did Maria start her homework?			

Name: <u>ANSWER KEY</u>

Using Different Strategies

Read each word problem. Then, show the steps for solving it, and write the answer. Finally, describe the strategy you used.

Word Problem	Steps	Answer	Strategy Used
1. Angela's soccer team washed 32 cars on Saturday. Each customer paid $4.75 for the wash. Did her team earn the $80 they needed for their new uniforms? How much did the team earn?		Yes; $152	
2. Mark is having a picnic. He will prepare 3 hot dogs for each guest. There are 49 people coming. How many hot dogs will Mark prepare?		147	
3. Mr. Miller works 8 hours a day. Mrs. Miller works 6 hours a day. If Mr. Miller worked 96 hours in 2 weeks, how many hours did Mrs. Miller work during the same time?		72 hours	
4. Scott invited his friends over for pizza. Scott ate 6 slices. His friend Billy ate half as much as Scott. David ate twice as many slices as Billy but 4 fewer than Terrence. How many slices of pizza did each boy eat?		Scott: 6 Billy: 3 David: 6 Terrence: 10	
5. Maria had homework in 3 of her subjects. She finished all of it at 6:30 p.m. She spent 30 minutes on English and twice that long on science. She spent as long on math as she did on both English and science combined. At what time did Maria start her homework?		3:30 p.m.	

Name: _____

Reflection

Solve each released SOL test question. Then, give a brief explanation of the strategy you used.

1. A flight engineer for an airline flies an average of 2,923 miles per week. Which is the best estimate of the number of miles she flies in 3 years?

    F   150,000

    G   300,000

    H   450,000

    J   600,000

    Explain your strategy:

2. Last season, Ellen and Janet together won 32 tennis matches. Ellen won 6 more matches than Janet. How many matches did Ellen win?

    A   13

    B   16

    C   19

    D   25

    Explain your strategy:

Name: <u>**ANSWER KEY**</u>

Reflection

Solve each SOL released test question. Then, give a brief explanation of the strategy you used.

1. A flight engineer for an airline flies an average of 2,923 miles per week. Which is the best estimate of the number of miles she flies in 3 years?

    F   150,000

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    H   <u>450,000</u>

    J   600,000

    Explain your strategy:

    <u>Answers will vary.</u>

2. Last season, Ellen and Janet together won 32 tennis matches. Ellen won 6 more matches than Janet. How many matches did Ellen win?

    A   13

    B   16

    C   <u>19</u>

    D   25

    Explain your strategy:

    <u>Answers will vary.</u>

✳ SOL 6.7

Prerequisite SOL

5.3

Lesson Summary

Students practice mentally estimating and calculating, using the basic operations of addition, subtraction, multiplication, and division. (30 minutes)

Materials

Copies of the attached worksheets
Chart paper
Copies of the attached game cards, cut apart
Counters

Warm-up

Have students practice various problem-solving strategies by completing the "Missing Numbers Square" worksheet. When they are finished, lead a discussion of the *methods* they used to find the missing numbers. As the students offer their strategies, list them on a chart for display throughout this lesson.

Lesson

1. Begin the activity by giving students the opportunity to share what kinds of things they like to shop for at the mall. Ask them how they use math when shopping, and discuss their responses. Tell the students that they will be playing a game similar to Bingo that will give them helpful practice in *estimating* necessary calculations when they go shopping.

2. Give each student a copy of the attached "At the Mall Game Board" handout. Decide what will constitute a winning Bingo game board—traditional row, column, or diagonal; four corners; postage stamp; etc.—and explain it to the students. Pair the students, and give each pair a stack of the attached "At the Mall" game cards and some counters. Have the pairs of players decide which player is Player 1 and which is Player 2.

3. Each pair of players shuffles the game cards and places the stack face down. Player 1 draws the top card, solves the problem, using estimation or mental calculation, and announces the solution to Player 2. If the solution is on the game board (all solutions are on the board), Player 1 places a counter on that number on his/her game board. If the solution reached is not on the board, the solution is wrong, and Player 1 gives the game card to Player 2 for solving.

4. If Player 2 solves the problem correctly, he/she places a counter on that number on his/her game board. If Player 2 does not solve it correctly, he/she must ask the teacher to review with both players the calculations used and discuss the errors.

5. Player 2 draws the next card and follows the same procedure.

6. The game continues in this manner until one player achieves Bingo.

Reflection

Have students complete the "Memo: What I Remember" worksheet. Allow students time to share what they have written with their partners.

Name: _____

Missing Numbers Square

In the square below

- the numbers in each row add up to totals on the right
- the numbers in each column add up to the totals at the bottom
- the six missing numbers are whole numbers, 0 through 9.

Fill in the missing numbers, doing the calculations in your head. You may use a number more than once.

___	___	3	9	20
0	6	9	___	18
1	5	___	___	11
___	9	3	5	23
9	26	19	18	17

At the Mall Game Cards

The mall is having a special *"Buy 2, Save $20!"* sale on tennis shoes. How much will 2 pairs of tennis shoes cost during this sale?	Sandra is going to a dance. She has $60 and wants to buy a new dress. How much change will she get back?
Mrs. White has 3 children. Each of her children needs a new pair of jeans. How much will she spend?	The city basketball coach wants to buy each of his 9 team members a new sweat suit. How much money will the coach need?
Tommy plans to buy one pair of jeans, one T-shirt, and one belt. How much money will he spend?	Devon plans to buy 2 pairs of jeans. How much will he spend?
How much money will Ben save if he buys one pair of shorts instead of one sweat suit?	The mall is having a sale on sweat suits – *Buy 2 sweat suits and save $10 off the total cost!* How much would it cost to buy 2 sweat suits during this sale?
Mr. Jones has $40 and needs to buy a belt and 2 pairs of socks. How much change will he receive?	Jenna needs a new skirt, a new blouse, and a belt. How much money will she need to buy all the items?
Josh plans on buying a new outfit, but he wants to spend as little as possible. Should he buy jeans and a T-shirt or shorts and new tennis shoes? What is the cost of the least expensive combination?	Mary Anna is going to tennis camp. She needs to buy 4 pairs of socks, 1 pair of tennis shoes, and 2 T-shirts. How much money will she spend on these items?
Travis is on the cross country team at his school. He buys 5 pairs of tennis shoes during one year. How much money does Travis spend on tennis shoes?	Which costs more: one dress OR one skirt and one blouse? How much does the more expensive outfit cost?
Mrs. Davis is buying her two boys one pair of new jeans each, but she is spending only $50 of her own money. How much will each of her sons need to pay for his jeans?	Kayla is going to the beach and wants to buy 5 new T-shirts. How much money will she need to spend?
Marcus wants to buy a new pair of tennis shoes. He has $27. How much more money does he need?	Mrs. Johnson is buying herself a new sweat suit and a new pair of tennis shoes. How much money will she spend on these items?
Lisa bought one new pair of jeans and one blouse. She took $80 to the mall. How much change did she receive?	Michael buys a sweat suit and one pair of socks. How much money does he spend?
Matt gets $10 per week allowance. If he saves his money for 5 weeks, how much money will he have after buying a new pair of tennis shoes?	Ellen wants to buy a new skirt and belt, but she has only $37. How much more money does she need to buy both of these items?
Ms. Daniels needs new clothes for work. She buys 2 skirts, 4 blouses, and 1 belt. How much money does she spend?	Mariah bought a pair of shorts instead of a dress. How much money did she save?
Alex got $50 for her birthday. She bought one new pair of jeans. How much of her birthday money does she have left?	

At the Mall Game Cards: Answer Key

The mall is having a special *"Buy 2, Save $20!"* sale on tennis shoes. How much will 2 pairs of tennis shoes cost during this sale? $70	Sandra is going to a dance. She has $60 and wants to buy a new dress. How much change will she get back? $18
Mrs. White has 3 children. Each of her children needs a new pair of jeans. How much will she spend? $108	The city basketball coach wants to buy each of his 9 team members a new sweat suit. How much money will the coach need? $306
Tommy plans to buy one pair of jeans, one T-shirt, and one belt. How much money will he spend? $67	Devon plans to buy 2 pairs of jeans. How much will he spend? $72
How much money will Ben save if he buys one pair of shorts instead of one sweat suit? $13	The mall is having a sale on sweat suits – *Buy 2 sweat suits and save $10 off the total cost!* How much would it cost to buy 2 sweat suits during this sale? $58
Mr. Jones has $40 and needs to buy a belt and 2 pairs of socks. How much change will he receive? $0	Jenna needs a new skirt, a new blouse, and a belt. How much money will she need to buy all the items? $73
Josh plans on buying a new outfit, but he wants to spend as little as possible. Should he buy jeans and a T-shirt or shorts and new tennis shoes? What is the cost of the least expensive combination? $51	Mary Anna is going to tennis camp. She needs to buy 4 pairs of socks, 1 pair of tennis shoes, and 2 T-shirts. How much money will she spend on these items? $123
Travis is on the cross country team at his school. He buys 5 pairs of tennis shoes during one year. How much money does Travis spend on tennis shoes? $225	Which costs more: one dress OR one skirt and one blouse? How much does the more expensive outfit cost? $57
Mrs. Davis is buying her two boys one pair of new jeans each, but she is spending only $50 of her own money. How much will each of her sons need to pay for his jeans? $11	Kayla is going to the beach and wants to buy 5 new T-shirts. How much money will she need to spend? $75
Marcus wants to buy a new pair of tennis shoes. He has $27. How much more money does he need? $18	Mrs. Johnson is buying herself a new sweat suit and a new pair of tennis shoes. How much money will she spend on these items? $79
Lisa bought one new pair of jeans and one blouse. She took $80 to the mall. How much change did she receive? $16	Michael buys a sweat suit and one pair of socks. How much money does he spend? $46
Matt gets $10 per week allowance. If he saves his money for 5 weeks, how much money will he have after buying a new pair of tennis shoes? $5	Ellen wants to buy a new skirt and belt, but she has only $37. How much more money does she need to buy both of these items? $8
Ms. Daniels needs new clothes for work. She buys 2 skirts, 4 blouses, and 1 belt. How much money does she spend? $186	Mariah bought a pair of shorts instead of a dress. How much money did she save? $21
Alex got $50 for her birthday. She bought one new pair of jeans. How much of her birthday money does she have left? $14	

Name: _____

At the Mall Game Board

Jeans: $36	**Skirt:** $29
T-shirt: $15	**Socks:** $12
Blouse: $28	**Tennis shoes:** $45
Belt: $16	**Sweat suit:** $34
Dress: $42	**Shorts:** $21

$79	$46	$51	$72	$58
$306	$16	$18	$75	$11
$8	$108	$0	$123	$225
$21	$73	$5	$14	$67
$186	$13	$57	$70	$18

Name: _____

Memo: What I Remember

What did I learn today?

_____

_____

_____

What did I do well?

_____

_____

_____

What am I confused about?

_____

_____

_____

What do I need help with?

_____

_____

_____

How will I use this skill in real life?

_____

_____

_____

✱ SOL 6.7, 7.4

Prerequisite SOL

Lesson Summary

Students solve multistep practical problems involving whole numbers by using the operations of addition, subtraction, multiplication, and division. (30–45 minutes)

Materials

Copies of the attached worksheets
Math textbooks
Calculators (optional)

Warm-up

Identifying and completing a pattern will help students discern the operation being used and is one method for solving word problems. Have students complete the "Follow That Pattern" worksheet. Review answers with students.

Lesson

1. Ask students how they can figure out what to do to a solve word problem, and make sure that they fully explain the process they follow. Record their strategies, and display this list on the board or a chart.

2. Give each student a copy of the attached "Problem-Solving Checklist." Juxtapose it with the list of strategies just made. Ask students to point out the similarities and differences between their list and the checklist and to compare and contrast the steps in the two lists.

3. Guide students in applying the "Problem-Solving Checklist" to various selected word problems from classroom math textbooks. Ask students to explain how they decided which information to put into the Understand, Plan, Solve, and Check categories. Have students also explain how they chose the operation(s) to use in each problem.

4. Select additional word problems from the textbooks, and have the students independently apply the checklist to them. Review each category with them, the operation(s) chosen, and the reasonableness of the solution.

Reflection

Pair the students, and assign one student in each pair to be Person A and the other Person B. Direct the A's to explain to the B's the most important idea in this lesson. Allow the A's one minute to think about this and make the explanation. Then, have the partners reverse roles.

Name: _____

Follow That Pattern

Finish the patterns in the rows below, and identify the pattern in the last column.

Pattern	First term	Second term	Third term	Fourth term	Fifth term	Sixth term	What is the pattern?
1.	7	5	7	5			
2.	1	3		27	81		
3.	192	96	48		12		
4.	2	5	8	11			
5.	5	10		20		30	
6.	17	16	13	12			
7.	8	11		17		23	
8.	1	10	2	20			
9.	64	32		8		2	
10.	2	10	50	250			

Name: _____

Problem-Solving Checklist

Complete each step below, and put an **X** in the box when each is complete.

Understand

☐ What do you know?

_____

☐ What do you need to find?

_____

Plan

☐ How can you find the answer? (+, −, ×, ÷)

_____

Solve

☐ Calculate the answer.

_____

_____

The answer is _____

Check

☐ How do you know your answer is correct?

_____

_____

✳ SOL 7.4

Prerequisite SOL

5.3, 6.7

Lesson Summary

Students practice identifying appropriate strategies to solve problems. (30–45 minutes)

Materials

Copies of the attached worksheets
Calculators (optional)

Warm-up

Have students complete the "What Do YOU Think?" worksheet. Ask the students to explain their responses. Encourage discussion about the similarities and differences in their responses.

Lesson

1. Ask students how thinking about the *meaning* of addition can help when solving word problems. Give students a chance to explain individually and share their thoughts with each other. Repeat this process for subtraction, multiplication, and division.
2. Ask students what different strategies are used to solve word problems. List their answers, and keep these strategies on display throughout the lesson. Ask whether they are more comfortable using certain strategies then others. If they answer yes, ask them to explain.
3. Distribute the "What's the Story?" worksheets, and review the directions, noting that there is a combination of multiple-choice and free response problems. Also emphasize the importance of explaining solutions thoroughly when asked to do so.
4. Have students complete the worksheets, offering assistance as needed while they work. Their responses will help you help them with any misunderstanding or errors. You may want to work on the theater problem one day and the camping problem the next, depending on your the time available.
5. Once students are finished, review answers with the class. Clear up any errors or confusion.

Reflection

Have students complete the "Reflection" worksheet. You may want to collect, check, and return these to give individual feedback to students.

Name: _____

What Do YOU Think?
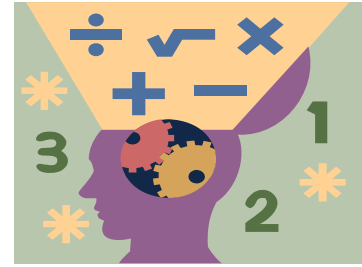
1.   In your own words, write what it means to add.

_____

_____

2.   In your own words, write what it means to subtract.

_____

_____

3.   In your own words, write what it means to multiply.

_____

_____

4.   In your own words, write what it means to divide.

_____

_____

Name: _____

What's the Story? 1

Read the story carefully. Then, read each question, and consider all choices before choosing a solution.

A Day of Theater

The Martinez family is going to a play in Richmond. A round trip train ticket costs $8.00. Children under 7 years old travel for half price. The bus from the train station to the theater costs $2.00 per person each way. Tickets for the play are $14.00 for an adult and $6.00 for a child.

Mr. and Mrs. Martinez will go with their sons, Ricky and Thomas, and their daughter, Ramona. Ramona and Ricky are 12 years old. Thomas is 6 years old.

1. How much will it cost the entire Martinez family to take the train to Richmond and back?

    A $16.00

    B $8.00

    C $40.00

    D $36.00

2. It is most expensive for

    A   Mr. and Mrs. Martinez to travel to and from the play.

    B   Mr. Martinez, Ricky, and Thomas to buy theater tickets.

    C   Mr. and Mrs. Martinez to buy theater tickets.

    D   Mrs. Martinez, Ricky, and Ramona to travel to and from the play.

3. A class of children is also going to the play. It spends $158 on tickets for the students and the teacher. How many students are in the class? Explain your solution.

4. What would be the *entire* cost of the trip for 12 students if 5 of the students are younger than 7 years old? Explain your solution.

Name: _____

What's the Story? 2

Read the story carefully. Then, read each question, and consider all choices before choosing a solution.

A Camping Trip

Scouting Troop A is going on a hike. There are 8 scouts and 2 adults on the trip, each with a backpack. Each adult weighs about 160 pounds. Each scout weighs about 100 pounds. Each backpack weighs about 20 pounds.

The troop is getting ready to cross a river in a small boat. The boat can hold up to 360 pounds without sinking.

1. The boat will be filled to its limit by

   A   1 scout and 7 backpacks.

   B   1 adult and 2 scouts.

   C   3 scouts and 3 backpacks.

   D   2 scouts and 3 backpacks.

2. The weight of 1 adult is equal to

   A   8 backpacks.

   B   1 scout and 5 backpacks.

   C   1 scout and 4 backpacks.

   D   2 scouts.

3. What weighs the same as 3 scouts and 1 backpack?

   A   1 adult and 5 backpacks

   B   1 adult and 8 backpacks

   C   2 adults

   D   2 adults and 1 backpack

4. What is the combined weight of all scouts, adults, and backpacks? Explain your solution.

Name: _____

Reflection

1. Write one word problem involving addition in which the answer is 4.

2. Write one word problem involving subtraction in which the answer is 6.

3. Write one word problem involving multiplication in which the answer is 16.

4. Write one word problem involving division in which the answer is 5.

Name: _____

Released SOL Test Questions

1. A bag of chocolate candy holds exactly 408 pieces. Eight friends plan to share the chocolate pieces equally. How many chocolate pieces should each friend receive?

    F   3,264

    G   416

    H   400

    J   51

2. A flight engineer for an airline flies an average of 2,923 miles per week. Which is the *best* estimate of the number of miles she flies in 3 years?

    F   150,000

    G   300,000

    H   450,000

    J   600,000

Name: <u>ANSWER KEY</u>

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